



# Spectral Gamma-Ray Borehole Log Data Report

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Borehole

# 30-11-06

Log Event A

## Borehole Information

Farm : <u>C</u>	Tank : <u>C-111</u>	Site Number : <u>299-E27-64</u>
N-Coord : <u>42,957</u>	W-Coord : <u>48,469</u>	TOC Elevation : <u>646.49</u>
Water Level, ft :	Date Drilled : <u>2/28/1970</u>	

## Casing Record

Type : <u>Steel-welded</u>	Thickness : <u>0.280</u>	ID, in. : <u>6</u>
Top Depth, ft. : <u>0</u>	Bottom Depth, ft. : <u>100</u>	

## Borehole Notes:

This borehole was drilled in February 1970. At the initial collar location, the drill struck the tank footing at a depth of 36 ft. The rig was moved to a new collar location 1 ft away from the tank. This borehole was completed at a depth of 100 ft with 6-in.-diameter casing (Chamness and Merz 1993). Neither the driller's log nor drilling summaries contained in Chamness and Merz (1993) mention perforations or grouting; therefore, it is assumed that the casing is not perforated or grouted. The casing thickness is assumed to be 0.280 in., on the basis of the nominal thickness of the schedule-40, 6-in. pipe.

The top of the casing is the zero reference for the log. The casing lip is approximately even with the ground surface.

## Equipment Information

Logging System : <u>1B</u>	Detector Type : <u>HPGe</u>	Detector Efficiency: <u>35.0 %</u>
Calibration Date : <u>02/1997</u>	Calibration Reference : <u>GJO-HAN-13</u>	Logging Procedure : <u>P-GJPO-1783</u>

## Log Run Information

Log Run Number : <u>1</u>	Log Run Date : <u>03/05/1997</u>	Logging Engineer: <u>Alan Pearson</u>
Start Depth, ft.: <u>0.0</u>	Counting Time, sec.: <u>100</u>	L/R : <u>L</u> Shield : <u>N</u>
Finish Depth, ft. : <u>18.0</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>
Log Run Number : <u>2</u>	Log Run Date : <u>03/06/1997</u>	Logging Engineer: <u>Alan Pearson</u>
Start Depth, ft.: <u>99.0</u>	Counting Time, sec.: <u>100</u>	L/R : <u>L</u> Shield : <u>N</u>
Finish Depth, ft. : <u>17.0</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>
Log Run Number : <u>3</u>	Log Run Date : <u>03/07/1997</u>	Logging Engineer: <u>Alan Pearson</u>
Start Depth, ft.: <u>0.0</u>	Counting Time, sec.: <u>100</u>	L/R : <u>L</u> Shield : <u>N</u>
Finish Depth, ft. : <u>20.0</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>



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## Analysis Information

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Analyst : H.D. Mac Lean

Data Processing Reference : MAC-VZCP 1.7.9

Analysis Date : 09/05/1997

### Analysis Notes :

The SGLS log of this borehole was completed in three logging runs. A centralizer was used during all logging runs. Two logging runs were required to log the borehole; a third logging run repeated overlapping segments of the initial borehole log as an additional quality assurance check. The pre-survey field verification spectra for all logging runs and the post-survey field verification spectra for the first logging run met the acceptance criteria established for peak shape and system efficiency. The post-survey field verification spectra for the two latest logging runs failed to meet the acceptance criteria established for the system efficiency. For these logging runs, the energy and peak-shape calibration from the pre-survey verification spectra were used to establish the channel-to-energy parameters used in processing the logging spectra. For the remaining logging runs, the field verification spectra that best matched the logging run data were used to establish the applicable channel-to-energy parameters. There was negligible gain drift during the logging runs and it was not necessary to adjust the established channel-to-energy parameters to maintain proper peak identification.

Casing correction factors for a 0.280-in.-thick casing were applied during the analysis.

Cs-137 was the only man-made radionuclide detected in this borehole log. Cs-137 contamination was detected at the ground surface, almost continuously from the surface to a depth of 40.5 ft, and at the bottom of the logged interval (99 ft). The measured concentrations of most of the Cs-137 occurrences were just at or below 1 pCi/g. However, zones of slightly higher concentrations occur at depths of 1 ft (7pCi/g), 11 ft (5 pCi/g), and 38.5 ft (1pCi/g). The measured Cs-137 concentration at the ground surface was approximately 13 pCi/g.

The logs of the naturally occurring radionuclides show an increased K-40 background concentration (12 to 15 pCi/g) between 41 and 61 ft and an even higher background concentration (16.5 pCi/g) below 61 ft. The background Th-232 concentrations also increase perceptibly below a depth of 61 ft.

An analysis of the shape factors associated with applicable segments of the spectra was performed. The shape factors provide insights into the distribution of the Cs-137 contamination and into the nature of zones of elevated total count gamma-ray activity not attributable to gamma-emitting radionuclides.

Details concerning the interpretation of data for this borehole are presented in the Tank Summary Data Report for tank C-111.

### Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations.

Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes the man-made and natural radionuclides, the total gamma derived from the



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spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

Plots of the spectrum shape factors are included. The plots are used as an interpretive tool to help determine the radial distribution of man-made contaminants around the borehole.

A separate plot of the repeated segment of the log is included. The plot shows the Cs-137 concentrations and the naturally occurring radionuclides measured by the original and repeated logging runs. The uncertainty of each measurement (two-sigma or 95-percent confidence level) is indicated on the plot. The concentrations measured by the original and repeated logging runs are generally within the indicated uncertainty of the measurements.